Software Requirements Specification
Redstone Requirements Review

CLCS Test Build and Control CSCI

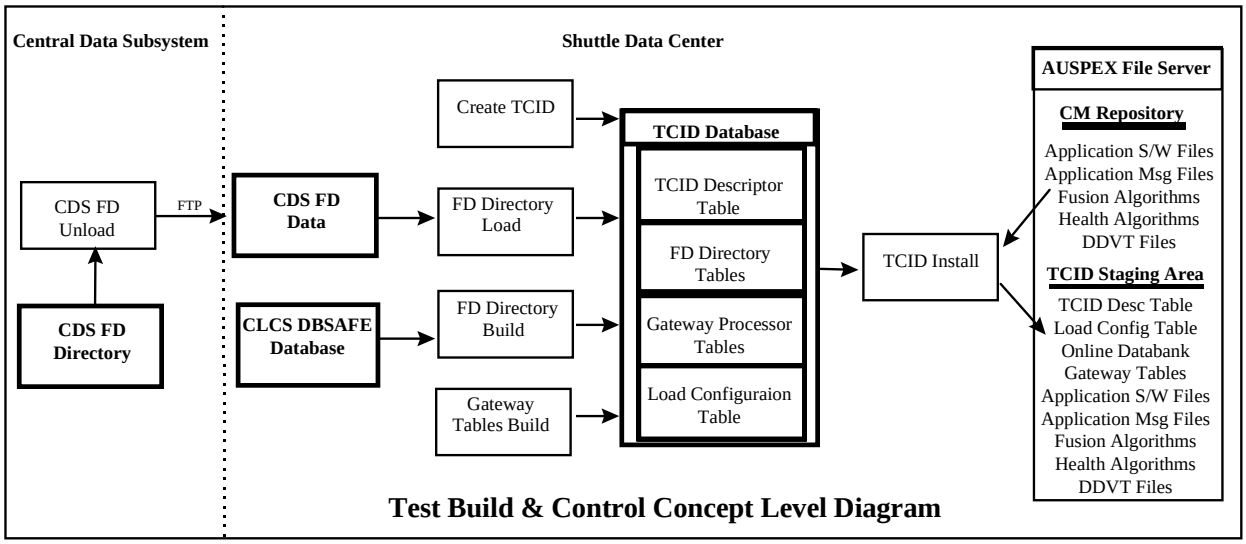
Redstone Requirements

1. CSCI Test Build & Control

1.1 CSCI Test Build & Control Introduction

1.1.1 CSCI Test Build & Control Overview

Test Build and Control resides in the Shuttle Data Center (SDC) and provides the capability to create, populate, and install the tables and files that make up a Test Configuration Identifier (TCID). For each TCID, tables will be created for a CLCS Function Designator (FD) Directory, the CLCS Gateway Processor(s), a TCID Descriptor, and other tables as required. Tables will be populated with data extracted from the CLCS Database Shuttle Automated Function Executive (DBSAFE) Database* and data derived through software processing. Installation will generate deliverable files based on the content of the TCID tables, and install the deliverable TCID files, application software files (including Health and Fusion applications) and Dynamic Data Visualization Tool (DDVT) files into the TCID Staging Area for subsequent transfer to a CLCS set.



Test Build & Control Concept Level Diagram

1.1.2 CSCI Test Build & Control Operational Description

Creation of a TCID is initiated at user request via a Graphical User Interface (GUI). The user selects specific options and supplies input parameters required for creating the TCID structure. Via the Create TCID software, the user is verified as a valid user and tables that make up the TCID are created with appropriate permissions.

For Redstone, the user initiates a CDS function via the CCMS System Interface (CMSI) to extract FD information from the CDS FD Directory. Once the data is extracted, the user transfers the extracted data files to the SDC via FTP. Next, via a GUI interface, the user initiates a process to load the CDS FD data into the FD Directory Tables of the TCID structure.

* For Redstone, non-GSE data will be extracted from the Central Data Subsystem's FD Directory and loaded into the FD Directory tables in the SDC. Only GSE and Fusion FD data will be obtained from the CLCS DBSAFE Database.

After the TCID tables are created and the CDS FD data loaded, the user initiates a an FD Directory Build process via a GUI interface to populate the TCID tables with derived data and data extracted from the CLCS DBSAFE DATABASE Database. The required data is selected based on criteria input by the user when initiating the build process and from data defined in the CLCS DBSAFE Database. FD information (i.e., compiler data, hardware data, and test end item address data) is pulled from the CLCS DBSAFE Database and processed into the FD Directory tables. For Redstone, only GSE and Fusion FD data will be obtained from the CLCS DBSAFE Database.

Following successful population of the FD Directory Tables, the user initiates the Gateway Table Build process via a GUI interface. The user specifies the Gateway(s) for which processing tables are to be populated. For each Gateway selected, test end item address data is pulled from the FD Directory and processed into appropriate tables.

After successful completion of the TCID create and build processes, a TCID Install process is initiated via a GUI interface by the user. The installation process extracts data from the TCID tables, organizes the data into deliverable files, and places the deliverable set of files into a TCID Staging Area.. In addition, the installation process selects the application files from the CM Repository and moves these to the TCID Staging Area. The deliverable set of files consists of an OLDB file, Gateway Table file(s), a TCID Descriptor file, a Load Configuration file, and Application Software files (Test End Item Managers, Data Fusion algorithms, Data Health algorithms, DDVT files, etc.).

1.2 CSCI Test Build & Control Specifications

1.2.1 CSCI Test Build & Control Groundrules

The following groundrules and assumptions apply to the Test Build and Control CSCI:

- A Relational Database Management System (RDBMS) will be provided in the SDC to support the creation, population and installation of TCID data.
- RDBMS database instances and tablespaces will be created and deleted by a Database Administrator. These will be pre-allocated in advance of TCID creation.
- Network connectivity will be provided between the SDC and the AUSPEX file server to support access to the CM Repository and TCID Staging Area(s).
- For Redstone, directories and files created for a specific TCID will be manually removed from the TCID Staging Area on the AUSPEX file server when the TCID is no longer needed..
- Application program files, application message files, DDVT files, Data Fusion algorithms, and Data Health algorithms will be obtained from the CM Repository on the AUSPEX file server. These files will be transferred into the repository via the CLCS Development Environment CSCI.
- Application program files, application message files, DDVT files, Data Fusion algorithms, and Data Health algorithms in the CM Repository will be “baselined” according to TCID Responsible System (TCID-RSYS) and TCID via the CLCS Development Environment CSCI.
- Application program files, application message files, DDVT files, Data Fusion algorithms, and Data Health algorithms in the CM Repository will be “tagged” via the CLCS Development Environment CSCI to reflect the development state of the application (e.g., unverified, integrated, verified, etc.).
- For Redstone, user access to the CDS FD Directory unload process will be controlled through the CDS CCMS System Interface (CMSI). Users must have valid accounts on CDS, permissions to access CMSI and CMSI permissions to execute the function.
- User access to SDC-resident Test Build and Control components will be controlled via the access control mechanisms (HTML forms) developed to support CCMS Support Software replatform. Users must be on a valid subnet, have valid accounts on the SDC, and have permissions to execute the build functions.

- All TCID files to be installed on a target CLCS Set will be put into a TCID Staging Area on the AUSPEX file server. The System Control CSCI will be responsible for transferring these files to the Ops CM Servers of the target CLCS sets.
- Only one TCID will be processed at a time within a single session.
- The DBSAFE CSCI will provide a means of defining a TCID's build requirements prior to initiating the actual TCID build process.
- The DBSAFE CSCI will provide tables for each TCID that define the Vehicle Configuration Number (VCN), DB-RSYS, Database Userid, Control Room Type, Gateway Processor, and Address criteria required to extract Function Designator information from the CLCS DBSAFE Database into the FD Directory for a specified TCID.
- The DBSAFE CSCI will provide tables that define the grouping of Database Responsible Systems to TCID Responsible Systems (TCID-RSYS). There will be a one-to-many correspondence of TCID-RSYS to Command & Control Processors (i.e., a TCID-RSYS will not span multiple CCP's, but a CCP may support multiple TCID-RSYS's).
- The Simulation System will access the FD Directory to create the model databases using the same approach used to support the Shuttle Ground Operations Simulation (SGOS) replatform effort. Changes in data fields in the FD Directory may require changes to the Simulation CSCI.
- The Data Recording, Archival & Retrieval CSCI will access the FD Directory to create the CLCS AP file. This file provides the information necessary to retrieve and evaluate command/measurement data that has been recorded in the SDC on a TCID and FD basis.
- Operational responsibilities for creating, populating and installing a TCID will belong to USA LPS S/W Integration Department.
- The new FD-ID's in the FD Directory will affect the Consolidated Systems Gateway.
- The Consolidated Shuttle Data Stream Gateway relies on the CCMS Common Data Buffer FIFO data stream to supply existing CCMS measurement data to the Consolidated Systems Gateway. This will force a dual build activity - one build for CCMS and one build for CLCS.
- Data Health functions will not require any special build products.
- The TCID will not contain a reference to the OS version of each supported subsystem/platform.
- For Redstone, Fusion FD's will be restricted in this release to currently supported data types (e.g. analog, discrete, digital pattern).
- No Gateway Processor tables will be generated for Fusion FD's. Fusion FD's will be managed by the build software similar to how Pseudo FD's are currently managed.
- FD information extracted from the CDS FD Directory will be manually transferred to SDC via FTP.
- For Redstone, application programs, application message files, DDVT files, Data Health Algorithms and Data Fusion Algorithms will not require any special products for build and will be handled by installation software directly from the CM Repository.
- For Redstone, the CLCS DBSAFE Database will provide GSE and Fusion FD information. All other FD information will be obtained from the CDS FD Directory.

1.2.2 CSCI Test Build & Control Functional Requirements

Functional requirements for the Test Build and Control CSCI are arranged in the following order:

1. Create TCID
2. CDS FD Unload
3. FD Directory Load

4. FD Directory Build
5. Gateway Table Build
6. TCID Install.

1. Create TCID:

(NOTE: TCID Tables are described in detail in the Test Build, Load & Activation Interface Description Document).

1.1 Create TCID shall accept as user input:
- TCID Name and Revision
- Test Build Software Version.

1.2 Create TCID shall create FD Directory Tables to store the following information:
- Common FD Data (e.g., FD Name, Nomenclature, DB-RSYS, etc.)
- Type-specific FD Data (e.g., discrete states, analog coefficients, etc.)
- Source-specific FD Data (e.g., GPC Port, HIM number, RTU number, etc.).

1.3 Create TCID shall create Gateway Tables to store the following information for GSE Gateways:
- Gateway ID
- Command/Measurement Data
- Discrete Stimulus FDID Data
- Discrete Measurement FDID Data
- Polling Data
- Engineering Unit Conversion Data.

1.4 Create TCID shall create Load Configuration Tables to store the following information:
- TCID Definition
  - TCID Name
  - TCID Revision
  - Control Room Type
  - TCID Descriptor File Name
  - Number of FD's in the TCID
  - Number of FD's per DB-RSYS
  - Number of FD's per TCID-RSYS
  - Number of FD's per Gateway
- Online Databank Definition (for the TCID)
  - Online Databank Revision
  - Online Databank File Name
  - Online Databank FDID Index File Name
  - Online Databank FD Name Index File Name
- Gateway Definition (for each Gateway)
  - Gateway ID
  - Gateway Tables present
  - Gateway Tables sizes
  - Gateway Tables File Name
  - Gateway Tables Revision
- TCID Responsible Systems Definition (for each TCID-RSYS)
  - DB-RSYS List
- Application S/W Definition (for each TCID-RSYS)
  - Program Index
  - Program File Type
  - Program Name
  - Program Revision

- Program Size

1.5 Create TCID shall create TCID Descriptor Tables to store the following information:
- TCID Name
- TCID Revision Data (e.g., creation dates, update dates, etc.)
- CLCS DBSAFE Database Revision Data
- Compatible SCID Version Data.

1.6 Create TCID shall create database views of data in the FD Directory to support TCID Install processing.

1.7 Create TCID shall update the TCID Descriptor Table with the following information:
- TCID Name
- TCID Revision (set to zero)
- TCID Create Date and Time
- Test Build Software Version.

1.8 Create TCID shall generate the following output:
- Schemas for FD Directory Tables, Gateway Tables, Load Configuration Table, TCID Descriptor Table, and other tables/views as required
- Updated TCID Descriptor Table
- Status report (errors, warnings, completion codes, etc.).

2. CDS FD Unload:

2.1 CDS FD Unload accept as user input:
- TCID Name
- Output Pathname.

2.2 CDS FD Unload shall extract FD information for all FD's in the CDS FD Directory.

2.3 CDS FD Unload shall generate a FDID number for each extracted FD.

2.4 CDS FD Unload shall replace the CCMS System Software Revision Number (SSRN) with generated FDID number.

2.5 CDS FD Unload shall convert CDS FD information into CLCS compatible form (scaling, coefficients, buffer length, etc.)

2.6 CDS FD Unload shall convert extracted FD data from BCD to ASCII.

2.7 CDS FD Unload shall generate the following output:
- FD Common Data File
- Source Derived Data File
- PCM FD Data File
- GSE FD Data File
- MDM FD Data File
- UCS FD Data File
- System FD Data File
- Discrete FD Data File
- Analog FD Data File.

3. FD Directory Load:

3.1 FD Directory Load shall accept as user input:
- TCID Name and Revision
- A SQL*Loader control file containing references to extracted data files.

3.2 FD Directory Load shall validate the user-supplied TCID Name against the TCID Descriptor Table.

3.3 FD Directory Load shall load modified FD information into the FD Directory Tables.

3.4 FD Directory Load shall generate the following output
- Updated FD Directory Tables
- Status reports (SQL loader log file, error report, etc.)

4. FD Directory Build:

4.1 FD Directory Build shall accept as user input:
- TCID Name and Revision
- Test Build Software Release Level
- (optional) Gateway build directive.

4.2 FD Directory Build shall, based on the TCID Name and Revision, obtain parameters from the CLCS DBSAFE Database that define the data selection criteria for a TCID. These include the following:
- Control Room Type
- VCN's and associated Revision Numbers
- Database Userid's
- Formats
- TCID-RSYS's

(NOTE: "Format" refers to the primary field of an FD's hardware end item address. For GSE, format equates to HIM number; for PCM format equates to telemetry format; etc.).

4.3 FD Directory Build shall validate the user-supplied TCID Name against the TCID Descriptor Table.

4.4 FD Directory Build shall validate the user-supplied TCID Name and Revision against the TCID configurations defined in the CLCS DBSAFE Database.

4.5 FD Directory Build shall validate software compatibility against the Test Build Software Version contained in the TCID Descriptor Table.

4.6 FD Directory Build shall accept an optional Gateway build directive to add, delete or rebuild FD's for a specific Gateway, provided the Gateway is defined for the TCID in the CLCS DBSAFE Database.

4.7 If no Gateway build directive is specified, FD Directory Build shall generate FD data for all Gateways defined for the TCID in the CLCS DBSAFE Database.

4.8 FD Directory Build shall validate the TCID Configuration Definition is locked from update.

4.9 FD Directory Build shall validate the VCN's for the TCID are locked from update.

4.10 FD Directory Build shall validate the Database Userid's for the TCID are locked from update.

4.11 FD Directory Build shall validate the Formats for the TCID are locked from update.

4.12 FD Directory Build shall use the following criteria to include an FD in the FD Directory:
- FD has a VCN association that is defined for the TCID in the CLCS DBSAFE Database
- FD has a Link Indicator/Format association that is defined for the TCID in the CLCS DBSAFE Database
- FD has a DB-RSYS association that is defined for the TCID in the CLCS DBSAFE Database
- FD has a Database Userid association that is defined for the TCID in the CLCS DBSAFE Database
- If an FD meets the above selection criteria on multiple VCN's or Formats, then the VCN or Format with the highest Database Userid priority is chosen.

4.13 FD Directory Build shall convert FD information extracted from the CLCS DBSAFE Database to appropriate formats (e.g., ASCII to Integer, etc.) as necessary.

4.14 FD Directory Build shall insert/update FD Directory tables with compiler-related, hardware-related and test end item address-related data obtained from the CLCS DBSAFE Database as determined by the above selection criteria.

4.15 FD Directory Build shall assign a unique FDID to each FD.

4.16 FD Directory Build shall update the TCID Descriptor Table with the following information:
- TCID Revision
- FD Directory Revision
- FD Directory Revision Date and Time

4.17 FD Directory Build shall update the Load Configuration Table with the following information:
- Control Room Type
- TCID Responsible Systems
- Database Responsible Systems
- Gateway ID's
- Number of FD's in the TCID
- Number of FD's per DB-RSYS

- Number of FD's per TCID-RSYS
- Number of FD's per Gateway by data type

4.18 FD Directory Build shall report an error and terminate processing if any of the following conditions are true**:**

- TCID Name and Revision is indecipherable
- TCID Name and Revision is not defined in the CLCS DBSAFE Database
- FD Directory Build software is incompatible with the TCID structures
- TCID Configuration defined for the TCID is not locked
- VCN's defined for the TCID are not locked
- Database Userid's defined for the TCID are not locked
- Formats defined for the TCID are not locked.

4.19 Upon completing the population of the FD Directory Tables, FD Directory Build shall update the following items in the CLCS DBSAFE Database:

- TCID Create Date and Time
- Test Build S/W Version
- CLCS DBSAFE Database Revision

4.20 FD Directory Build shall generate the following output:

- Updated FD Directory Tables
- Updated TCID Descriptor Table
- Updated Load Configuration Table
- Status Report (warnings, errors, information, completion codes, etc.).

5. Gateway Table Build

[NOTE: For Redstone, Gateway Table Build is limited to GSE data]

5.1 Gateway Table Build shall accept as input from user:

- TCID Name and Revision
- Gateway Processor Names
- (optional) Pathname of a file containing a special processing directives applicable to the Gateways specified.

5.2 Gateway Table Build shall validate the TCID Name and Revision against the TCID Descriptor Table.

5.3 Gateway Table Build shall validate software compatibility against the Test Build Software Version contained in the TCID Descriptor Table.

5.4 Gateway Table Build shall limit table build processing to Gateways specified via user input (i.e., a subset of those defined for the TCID).

5.5 For GSE Gateways, Gateway Table Build shall process an input file that contains directives for reserving a specified number of 10 sample per second null entries in the sublist for changing FD sample rates in real-time.

5.6 Gateway Table Build shall output an error message and terminate if the main polling table list becomes full.

5.7 Gateway Table Build shall process FD information in the FD Directory to populate the following tables for GSE Gateways:

- Gateway ID
- Command/Measurement Data Table (CMDT)
- Discrete Stimulus FDID Table.
- Discrete Measurement FDID Table
- Polling Tables
- Engineering Unit Conversion Tables

5.8 Gateway Table Build shall update the TCID Descriptor Table with the following information:

- Gateway Tables Revision
- Gateway Tables Revision Date and Time

5.9 Gateway Table Build shall update the Load Configuration Table with the following information:

- Gateway Tables present
- Table sizes:
  - Command/Measurement Data Table Size
  - Discrete Stimulus FDID Table Size
  - Discrete Measurement FDID Table Size
  - Polling Tables Size
  - Engineering Unit Conversion Tables Size.

5.10 Gateway Table Build shall generate the following output:
- Updated GSE Gateway Tables as defined above.
- Updated TCID Descriptor Table as defined above.
- Update Load Configuration Table as defined above.
- Status report (warning, errors, information, completion codes, etc.)

6. TCID Install

6.1 TCID Install shall accept as user input:
- TCID Name and Revision
- System Software Configuration Identifier (SCID) Version Number
- Selection criteria for the application program files to be installed.

6.2 TCID Install shall validate the user-supplied TCID Name and Revision against the TCID Descriptor Table

6.3 TCID Install shall validate software compatibility against the Test Build Software Version contained in the TCID Descriptor Table.

6.4 TCID Install shall issue a warning if the revision level of the FD Directory exceeds the revision level of the Gateway Tables.

6.5 TCID Install shall access the CM Repository to derive (based on TCID, TCID-RSYS, and the user-supplied selection criteria) a list of application program files and revisions to be included in the TCID.

6.6 TCID Install shall create a unique index number for each application program to be included in the TCID.

6.7 TCID Install shall update the Load Configuration Table with the following information based on each application program's associated TCID-RSYS:
- Application Program Index
- Application Program File Type
- Application Program Name
- Application Program Revision
- Application Program Size (in bytes)

6.8 TCID Install shall update the TCID Descriptor Table with the following information:
- Installation Revision
- Installation Revision Date and Time
- SCID Version Number

6.9 TCID Install shall extract information from the tables that comprise a TCID to create the following set of deliverable files:
- TCID Description
- Online Databank
- Online Databank FDID Index
- Online Databank FD Name Index
- Gateway Tables File for each Gateway

6.10 TCID Install shall update the Load Configuration Table with the following information:
- Online Databank File Name
- Online Databank FDID Index File Name
- Online Databank FD Name Index File Name
- Gateway Table File Name for each Gateway

- TCID Description File Name

6.11 TCID Install shall extract information from the Load Configuration Table of the TCID to create a Load Configuration File.

6.12 TCID Install shall copy the deliverable TCID files from the SDC into the directory structure in the TCID Staging Area defined by the System Control CSCI.

6.13 TCID Install shall copy application program files associated with the TCID from the CM Repository into the directory structure in the TCID Staging Area defined by the System Control CSCI. Program files will be based on the user-specified selection criteria.

6.14 TCID Install shall perform Little Endian (SDC) to Big Endian conversion on TCID product files as required.

6.15 Upon completing the installation of TCID product files into the TCID staging area, TCID Install shall update the CLCS DBSAFE Database with SCID Version.

6.16 The TCID Installation process will generate the following output:

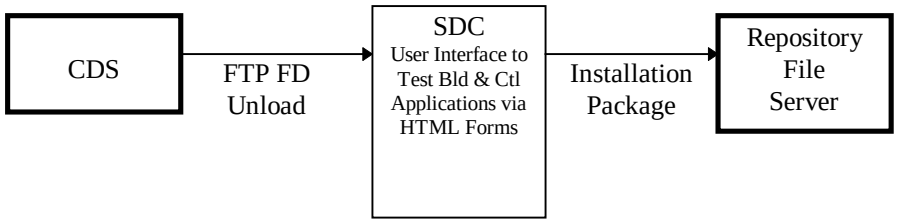
- Files for Online Databank, Load Configuration, GSE Gateway, DDVT, Data Fusion Algorithms, Data Health Algorithms, Application software, Application Message Files
- Updated TCID Descriptor Table
- Updated Load Configuration Table
- Status report (warning, errors, information, completion codes, etc.).

1.2.3 CSCI Test Build & Control Performance Requirements

Performance requirements are to be determined.

1.2.4 CSCI Test Build & Control Interfaces

- Interface to CDS for download of FD Directory data via File Transfer Protocol (FTP).
- User interface via GUI for initiating/managing the TCID create, build, and install functions..
- Interface to the repository file server for moving application software from the CM Repository to the TCID Staging Area.
- Interface to the repository file server for copying the deliverable TCID files from the SDC to the TCID Staging area.



1.2.5 CSCI Test Build & Control Data Flow Diagrams

External Data Flow